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Magnetic Excitations of Stripes Near a Quantum Critical Point and Checkerboards DAVID K. CAMPBELL, DAOXIN YAO, Depts. of Physics and Electrical and Computer Engineering, Boston University, ERICA W. CARLSON, Dept. of Physics, Purdue University — Competing tendencies in electronic systems with strong correlations can lead to spontaneous nanoscale structure, pattern formation, and even long-range spatial order. There has been continued interest in various charge and spin spatial order, including "stripe" and "checkerboard" phases. We explore the magnetic excitations of stripe and checkerboard phases within a semiclassical spin wave approximation. We show that simple checkerboard patterns are incompatible with recent neutron scattering experiments, while stripes near a quantum critical point (i.e. with weak coupling across the domain walls) exhibit much of the behavior seen in recent neutron scattering experiments on high temperature superconductors. At low energies, the spin wave cones of weakly coupled stripes have weight strongly peaked on the inner branches. As energy is increased, a saddlepoint produces a resonance peak, followed by a square-shaped continuum rotated 45 degrees from the low energy peak direction. We discuss the connection to recent high energy neutron scattering data on the cuprates, as well as the relation to quantum spin fluctations.

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